

PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

Treatment of Rimming Steel

We, RICHARD THOMAS & BALDWIN'S LIMITED, a British Company, of RTB House, 151, Gower Street, London, W.C.1, do hereby

5 declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 Rimming steel is economically desirable because of the high yield of useful steel that can be obtained from each cast. In addition it has a better surface finish than aluminium-killed steel. It is most commonly converted into sheet, which in turn is formed into such articles as motor car bodies. In this forming process there may be irregular localized yielding with the result that unsightly surface blemishes are produced on the sheet and frequently lead to rejection of articles made 15 from the sheet. These blemishes are known as stretcher-strain markings.

20 The irregular yielding is caused by a reduction in the stress required to produce small elongations after the yield point has been exceeded. A certain amount of further deformation continues to be localized instead of spreading. If this yield-point elongation can be eliminated the formed sheet will not exhibit stretcher-strain markings.

25 It is possible to counteract the formation of the stretcher-strain markings by subjecting the sheet to slight plastic deformation while it is in the annealed state required for the forming process. This slight plastic deformation is usually effected by temper-rolling or roller levelling, and may lead to elongation of the sheet by from 0.75 to 5%, and usually by about 1 to 1.5%.

30 Now in practice the final steps applied to the steel by the steel maker are the annealing and temper-rolling or the equivalent, and the sheet is then delivered either to a stock

holder or the ultimate user. In either case it may not be formed into the final article for some time.

45 One of the advantageous properties of rimming steel is a type of age-hardening, called strain-ageing, which slowly hardens the steel after it has been deformed by temper-rolling or pressing. Unfortunately an effect of this strain-ageing is the return of the yield-point elongation. As a result, if the sheet is not formed within a short time after the temper-rolling or the equivalent, stretcher-strain markings may appear on it when it is formed. The steel maker has of course no control over the time at which the sheet will in fact be formed.

50 Our object in this invention is to prolong the interval of time between the slight plastic deformation and the growth of the yield-point elongation to a value at which deleterious stretcher-strain markings are produced when the sheet is formed. We do this by effecting the slight plastic deformation at a temperature at least as low as -78°C, that is to say the temperature of dry ice. We prefer to effect the deformation at a lower temperature, which advantageously is that of liquid nitrogen (-196°C). We find that the return of the yield-point elongation during the strain-ageing is considerably postponed by means of our invention.

55 The effectiveness of the slight plastic deformation in delaying the return of the yield-point elongation increases both as the temperature is lowered and as the extent of the deformation is increased. Ideally it should be possible for the sheet to be stored for a year, and when this is the object the deformation should be effected at the temperature of liquid nitrogen and amount to 5% elongation. However, a lesser period of delay is of great practical value and may be obtained either by

usually temper rolled
while in the annealed state

5% elongation at the temperature of dry ice or by 1% elongation at the temperature of liquid nitrogen. The most advantageous combination of elongation and temperature is 5 1.5% elongation at the temperature of liquid nitrogen.

WHAT WE CLAIM IS:—

- 10 1. A method of counteracting the appearance of stretcher-strain markings on rimming steel by subjecting the steel in the annealed state to slight plastic deformation in which the slight plastic deformation is effected at a temperature at least as low as -78°C .
2. A method of counteracting the appearance

of stretcher-strain marking on rimming steel 15 in which the steel in the form of annealed sheet is temper-rolled to give an elongation of at least 1% while it is at the temperature of liquid nitrogen.

3. A method according to claim 2 in which 20 the temper-rolling is such as to produce an extension of at least 1.5%.

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